
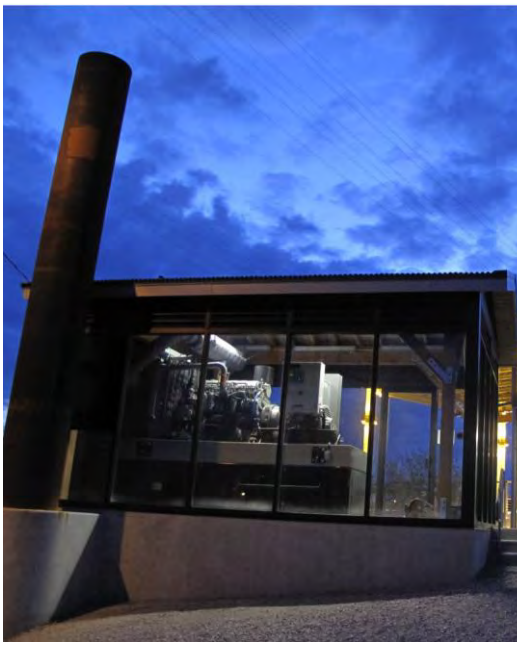


ANMORE SOUTH NEIGHBOURHOOD PLAN

Infrastructure Servicing Report

Project No: 23-291

MARCH 14, 2025

Aplin & Martin Consultants Ltd.

APLIN MARTIN

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

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Revision History

Revision	Date	Details	Name
0	March 8, 2024	Submitted for Village Review	Adam Sullo, P.Eng. (AB)
1	November 8, 2024	Revised Per Phase 1 Public Engagement	Adam Sullo, P.Eng. (AB)
2	March 8, 2025	Revised Servicing Report	Ben Loewen, P.Eng., PMP, GDBA
3	March 14, 2025	Revised Servicing Report	Ben Loewen, P.Eng., PMP, GDBA

Acknowledgement

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Corporate Authorization

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Executive Summary

The Anmore South Neighbourhood Plan proposes a 61.14 hectare (150.08 acre) mixed-use community at the south end of the Village of Anmore, BC. The proposed neighbourhood comprises a mix of residential, commercial, and community-based land uses, over a 20-year phased build-out.

This report summarizes the proposed water, sanitary, and drainage infrastructure servicing plans and Class C cost estimates for the Anmore South Preferred Plan (the Plan). Through the public neighbourhood planning process, and as the rezoning of land use designations (residential, civic, parks, recreation, etc.) is confirmed, further detailed refinements to the servicing plans are expected at future design stages.

The Plan proposes 2,202 residential development units in total, including single-family and duplex parcels, multi-family townhouses, and mid-rise apartments (up to 6 storeys). Population projections used to size infrastructure proposed in the servicing plans are based on the Village of Anmore (Village) engineering design criteria, which may produce a discrepancy between population projections generated for architectural and planning purposes. However, the Village's design criteria provides more conservative values and the servicing plans developed based on these criteria are to ensure the infrastructure is adequately sized to deliver resilient services to future developments.

Past assessments selected offsite water and sanitary servicing to run northwest along Ioco Road (north shore of the Burrard Inlet) from 1 Avenue to the southwest corner of Anmore. This proposed option remains in the preliminary planning stage, with detailed designs still outstanding and assumptions required for tie-in boundary conditions.

Water servicing infrastructure is proposed for the Plan area and to provide redundancy for the neighbouring Village of Anmore water system. The new onsite water servicing system was designed under the assumption that booster pumps, pressure reducing valves, and a reservoir would provide satisfactory residual pressures and required fire flows once connected to the offsite supply main. To maintain safe system operating pressures specified by the design criteria, four pressure zones were designed by setting pressure reducing valves to maintain the hydraulic grade across specific service areas. Due to topographical constraints, high pressure is anticipated at six (6) separate land use blocks (multi-family and commercial) requiring pressure reducing valves at building service connections.

Sanitary servicing infrastructure is proposed for the entire Plan area with the potential for future branch connections. The new onsite sanitary servicing system was designed under the assumption that steep existing grades would provide a normal/free outfall hydraulic grade condition at the trunk tie-in without experiencing backwater effects from downstream pipes. Due to topographical constraints, several land use blocks will require private, strata operated low-pressure sewer systems to convey sanitary loads uphill. The low-pressure system (LPS) areas are located in the south portion of the Plan Area off of Lower Loop. It is proposed that the Village of Anmore Engineer waive the low-pressure system minimum velocity requirement and provide feedback for acceptable mitigation measures to be developed at the detailed design stage, in lieu of satisfying this particular design criterion.

The drainage servicing plan balances infrastructure needs with ecological preservation. An underground storm sewer system will integrate with existing watercourses to service the Plan Area while maintaining pre-development flow patterns. The infrastructure is sized using 2050 climate projections, with the minor system designed for 1:10-year events under free flow conditions and the major system (creek channels and culvert crossings) capable of handling 1:100-year flows to minimize flooding risk and protect public safety. Low Impact Development (LID) source controls are incorporated both on individual lots and within road right-of-ways. For single-family parcels and roadways, directing impervious surface runoff to pervious areas will provide effective quantity and quality controls. For multi-family, mixed-use, and institutional developments, oversized bio-infiltration facilities (sized at 5% of impervious areas) will not only provide retention and enhance water quality, but also deliver runoff detention and flow control under the 5-year design condition, eliminating the need for conventional detention facilities while maintaining pre-development peak flow rates. The proposed drainage servicing plan represents a sustainable solution that addresses both development requirements and ecological preservation objectives including stream health and natural watershed hydrology.

1.0 Introduction

1.1. Project Background

The Anmore South Neighbourhood Plan proposes a 61.14-hectare (150.08-acre) mixed-use community at the south end of the Village of Anmore, BC. The proposed neighbourhood comprises a mix of residential, commercial, and community-based land uses, over a 20-year phased build-out. Aplin & Martin was retained for the Anmore South Neighbourhood Plan to provide civil servicing plans according to the Council approved Terms of Reference.

This report summarizes the proposed water, sanitary, and drainage infrastructure servicing strategy and Class C cost estimates for the Anmore South Preferred Plan (the Plan). Through the public neighbourhood planning process, and as the rezoning of land use designations (residential, civic, parks, recreation, etc.) is confirmed, further detailed preparation of servicing plans are expected at future design stages.

1.1.1. Site Area & Location

The Plan is proposed the area (referred as the Plan Aea) at the southwest-most corner of the Village, bounded by residential parcels to the north and east (including Anmore Elementary), while bordering the City of Port Moody to the south and west. The Plan Area is contained within a total area of 61.1 ha, including a segment of the 20 m (Minor Arterial) Sunnyside Road public right-of-way (ROW) and 3 existing undeveloped, forested parcels, identified by the British Columbia Assessment Authority (BCAA) as 1600, 1605, and 1755 Sunnyside Rd, Anmore.

BCAA property profiles for the Plan Area is provided for reference in **Appendix A**.

1.1.2. Existing Zoning & OCP Designations

The existing Plan Area are governed by the respective Village zoning (as of October 2023) and OCP (as of April 2019) bylaw designations. The subject area is currently zoned as ‘RS-1 Residential 1’, which allows for single family residential developments with minimum parcel size of 1 acre. The existing OCP designation for the Plan Area is “Hillside Residential”, allowing for the lands to be developed based on the Village’s cluster zoning with the required density of 1.5 lots per acre.

Figure 1 and **Figure 2** provide the existing zoning and OCP land use information for the Plan Area, respectively.

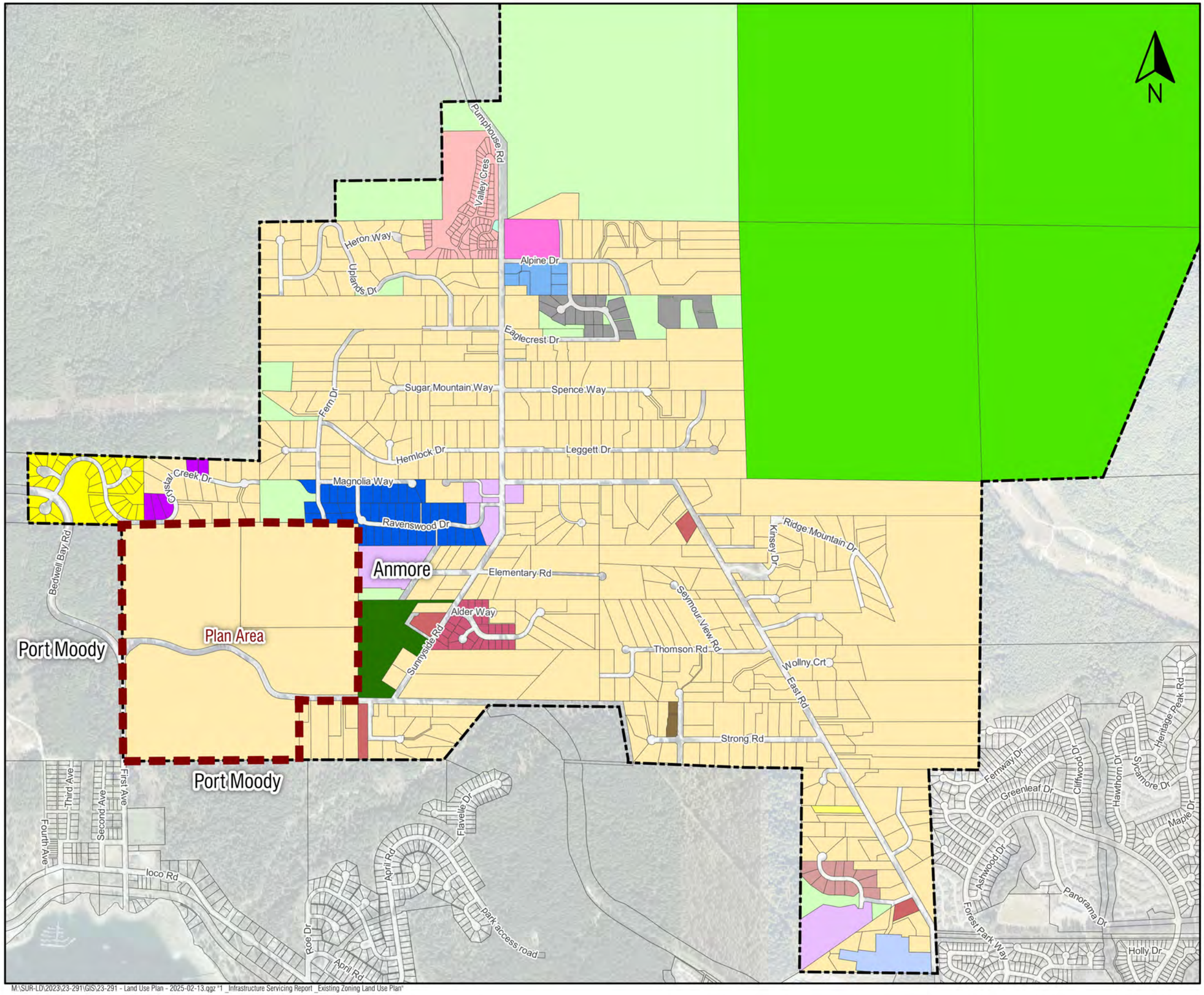
Upon successful public hearing and third reading of the Neighbourhood Plan through Village council, an application will also be submitted to Metro Vancouver to update the Metro Vancouver 2050 Urban Containment Area designation from ‘Rural’ to ‘General Urban’ for the Plan Area.

VILLAGE OF ANMORE

Anmore South Neighbourhood Plan

FIGURE 1

Infrastructure Servicing Report
Existing Zoning Land Use Plan



LEGEND

Anmore Zoning Bylaw No. 568-2017 (October 2023)

- C-1 Commercial 1
- C-2 Commercial 2
- C-3 Commercial 3
- CD-1 Comprehensive Development
- CD-2 Comprehensive Development
- CD-3 Comprehensive Development
- CD-4 Comprehensive Development
- CD-5 Comprehensive Development
- CD-6 Comprehensive Development
- CD-7 Comprehensive Development
- I-1 Industrial
- P-1 Residential 1
- P-2 Watershed
- W-1 Watershed
- RCH-1 Residential 1
- RCH-2 Residential 1
- RS-1 Residential 1
- RS-2
- RS-4
- RS-1A
- Infill
- Municipal Boundaries
- Existing Parcels
- Site Boundary

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Reviewer:	ACS
Revision:	1
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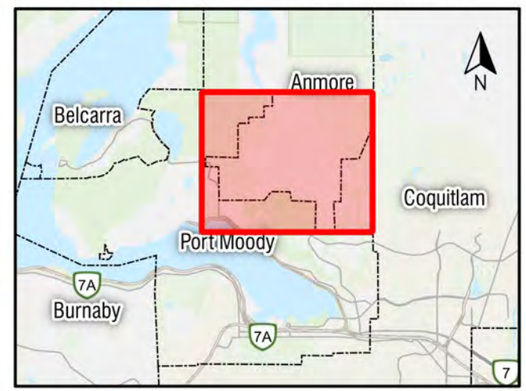

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Anmore South Neighbourhood Plan

FIGURE 2

Infrastructure Servicing Report
Existing OCP Land Use Plan

LEGEND

Anmore OCP Bylaw No. 532-2014 (April 2019)

- Residential
- Hillside Residential
- Parks
- Conservation & Recreation
- Commercial
- Institutional
- Village Centre Commercial
- Industrial
- Municipal Boundaries
- Existing Parcels
- Site Boundary

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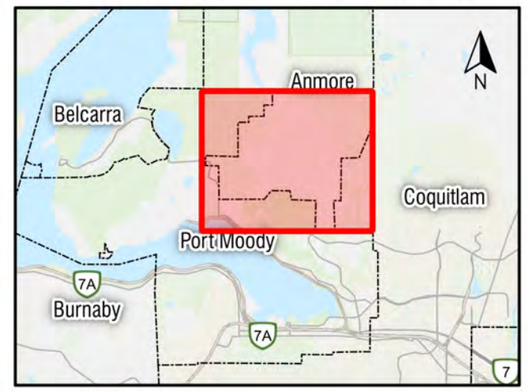

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1.2. Anmore South Preferred Plan

The Anmore South Preferred Plan comprises a mix of residential, commercial, and community-based land uses, over a 20-year phased build out. The Plan proposes 2,202 units, consisting of ground orientated single family and duplexes, multi-family townhouses, and mid-rise apartments (up to 6 storeys). Additionally, an approximately 1,858 sq. m (20,000 sq. ft) Community Centre space and approximately 5,110 sq. m (55,000 sq. ft.) of commercial area is proposed to support the expected growth.

The Plan aims to alleviate housing shortages within Metro Vancouver and sustainably expand community benefits, while protecting the existing semi-rural character of the Village. Land use blocks are proposed to connect with the surrounding transportation network through a series of new strata roads and public ROW dedications. As such, Sunnyside Road will link Fern Drive to the north, with looped First Avenue access to the southwest in addition to the existing intersection immediately to the west. Further road connections to the east and south are envisioned for future consideration.

The Preferred Plan Illustrative Concept is provided for reference in **Appendix B**.

1.2.1. Population Yields

Current onsite architectural data for the proposed Plan was used to tabulate total residential unit counts and developable commercial area for the purpose of yielding population equivalents. Yield rates were taken from the Village *Subdivision and Development Control Bylaw No. 633-2020, Schedule B – Detailed Design Criteria* and *BC Master Infrastructure Design Guidelines (MMCD) 2022*, with calculated values used for servicing analyses later in this report. Note that the use of these municipal development servicing criteria may produce a discrepancy between population equivalents generated within the Neighbourhood Plan process. The Village's design criteria provide more conservative values, and were used for the servicing plans development to ensure the infrastructure is adequately sized to deliver resilient services to future developments. Population yields for each proposed land use category have been summarized below in **Table 1**.

Table 1 – Unit Counts and Population Yields by Land Use

Land Use Description	Units	Gross Hectares	ppu / ppha	Population Equivalent (PE)
SF / Duplex	128	-	3.5	448
Townhome	740	-	3.1	2,294
Apartment	1,334	-	2.1	2,801
Commercial	-	1.39	90	125
Civic Centre	-	0.44	90	40
Residential	**2,202**	**-**	**[1]2.5**	**5,543**
Commercial & Institutional	**-**	**1.83**	**90**	**165**
TOTAL	**-**	**-**	**-**	***5,708***

[1]Average across all residential land uses

In total, the Plan currently proposes 2,202 residential units at multiple respective unit densities, housing an estimated population of 5,543. An additional 165 Population Equivalent (PE) is estimated from the unit rate of 90 ppha across 1.83 ha of proposed ICI land-use blocks. The ultimate build-out PE value of 5,708 and subsequent parcel block PE breakdowns were used to generate and allocate water demands and sanitary loads to the municipal servicing infrastructure models discussed later in this report.

An overview of the Preferred Plan Land Use, together with surrounding site features, is presented in **Figure 3**.

VILLAGE OF ANMORE

Anmore South Neighbourhood Plan

FIGURE 3

Infrastructure Servicing Report
Proposed Land Use Plan

LEGEND

- Municipal Boundaries
- Existing Anmore Parcels
- Site Boundary

Contours
- Major, 5 m
- Minor, 1 m

Proposed Land Use
- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve
- Road

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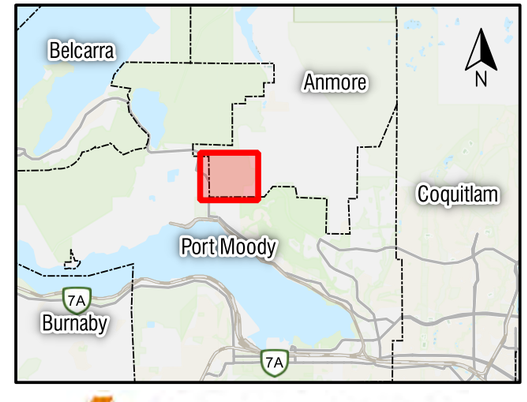

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1.3. Key Considerations

The following subsections summarize key work previously done by other consultants supporting the Plan. Pertinent information from these documents formed the preliminary considerations incorporated into engineering servicing concepts and analysis presented further in this report.

1.3.1. Offsite Servicing Concepts Presentation

In March 2023, Aplin Martin prepared an Offsite Servicing Concepts Presentation for the Plan Area.

The presentation indicates that several water and sanitary servicing route options and sub-options were examined for the cost-effectiveness and constructability necessary to service the Plan Area. Offsite servicing was selected to run along the south route, through Ioco Road by the shore of the Burrard Inlet to the southwest corner of the Village. This currently proposed option remains in the preliminary planning stage, with detailed designs still outstanding. Anticipated tie-in locations at the Plan Area boundary were derived for servicing designs and modeling presented further in this report.

The Offsite Servicing Concepts Presentation prepared by Aplin Martin is provided for reference in **Appendix C**.

1.3.2. Environmental Assessment

AquaTerra Environmental (AquaTerra) performed an Environmental Impact Assessment (EIA) for the Plan Area and prepared an EIA report dated March 08, 2025.

AquaTerra's EIA indicates that watercourse segments, south of Sunnyside Road, are fish-bearing. with Cutthroat Trout captured during the fish presence survey. Several invasive species were identified within the Plan Area, presenting an opportunity for habitat rehabilitation bioengineering throughout the Plan Area. GPS mapping was also conducted to identify culvert locations, watercourse orientation, high water mark and top-of-bank for subsequent site plan development. Watercourse, wetland, and riparian buffer linework was derived for use in drainage figures presented further in this report.

1.3.3. Preliminary Geotechnical Report

A preliminary geotechnical investigation was conducted by GeoPacific Consultants Ltd. (GeoPacific) for the Plan Area in the vicinity of Sunnyside Road and 1 Avenue The GeoPacific's report dated November 15, 2023 documented the findings from the geotechnical investigation.

The report indicates that Capilano Sediments are anticipated within the subject site, containing well-drained post-glacial sands resting above very dense glacial till. The Plan Area also partially falls within the BC Water Resources Atlas mapped extent of the confined aquifer, Aquifer 924, with a static groundwater table ~27 m below grade and not expected to be encountered during construction. Soil and groundwater characteristics determined from the report were used for stormwater management designs and drainage modeling, presented further in this report.

2.0 Utilities Servicing

2.1. Water Servicing

A new water system is proposed to serve the currently undeveloped Plan Area, with the potential for future tie-in locations to the existing Anmore water system at Fern Drive and Crystal Creek Drive to the north and Sunnyside Road to the east. These additional connections could provide redundancy and additional capacity to benefit the existing Anmore water supply. However, these potential connections to the existing Anmore infrastructure were not accounted for in this modeling analysis. This should be re-evaluated upon detailed design to determine impacts of such connections to the existing Anmore infrastructure on the servicing for the Plan Area. Due to topographical constraints and the current lack of water infrastructure planning within the vicinity, a comprehensive system consisting of booster pumps, pressure-reducing valves (PRV), feeder mains, distribution mains, and a reservoir contained within utility easements and public ROWs is proposed to service the Plan. The new water system is proposed to tie into the Metro Vancouver water supply main at the southwest corner of the Plan Area (with the assumed extension to this location as discussed in Section 1.3.1).

The following subsections present an overview of the existing water system, servicing design criteria, projected demands, proposed servicing plan, design considerations, and system analysis for proposed water services.

2.1.1. Existing Water System Overview

Very limited information is available for the existing Village water system. Asset and operational data are not currently accessible for public review via open data download or published master plans, but only through a web-based Geographical Information System (GIS) viewer maintained by the Village Engineer.

The Village currently receives water from twinned mains running southeast-northwest along East Road, which becomes Aspenwood Drive at the supply connection through Port Moody. Several PRVs and booster pumps exist within the Village water system, indicating the presence of pressure zones (PZ) designed to prevent extreme hydraulic grade lines (HGL) at locations with highly variable topography. Storage infrastructure does not currently exist within the Village.

Preliminary review of the existing water infrastructure suggests limited hydraulic redundancy due to the single supply connection from Port Moody and the high quantity of dead-end mains. The Village Engineer has indicated that a hydraulic model is now calibrated and available; water system assumptions continue to be used throughout this analysis in lieu of unavailable boundary condition data at the south tie-in point with Port Moody. Future integration of the proposed Plan with the Anmore water model is intended to provide improvement to the existing system and additional benefits to be identified at the detailed design stages.

2.1.2. Water Servicing Design Criteria

Water main design criteria used for hydraulic analysis and sizing were derived from Village *Subdivision and Development Control Bylaw No. 633-2020, Schedule B – Detailed Design Criteria* and *BC Master Infrastructure Design Guidelines 2022*. Village water design criteria are summarized below in **Table 2**.

.

Table 2 – Water Design Criteria Summary

Parameter	Design Criteria
Water Demand	
Average Day Demand (ADD)	550 Lpcd
Maximum Day Demand (MDD)	1,100 Lpcd
Peak Hour Demand (PHD)	1,650 Lpcd
Required Fire Flow (FF)	60 L/s for Single Family & Duplex, 90 L/s for Townhouse & Apartment, 150 L/s for Commercial
Residual Pressure	
Minimum Static Pressure under PHD	44 psi
Minimum Residual Pressure under MDD+FF	22 psi
Maximum Static Pressure	123 m or 150 psi with approval from Village Engineer for areas with multiple pressure zones
Pipe Size	
Distribution & Feeder Main	200 mm Ø and larger
Other	
Hazen-Williams Roughness Coefficient, C	125 for 250mm Ø and larger 125 for 200mm Ø and smaller*
Minimum Pipe Grade	0.1 %

**Based on pipe material MMCD assumptions and industry standards*

2.1.3. Projected Water Demands

Water demands projected for the Plan were estimated based on proposed land use PE yields and the Village design criteria. For water system analysis, the Plan area was divided into land use subcategories for per-capita demand calculation and fire flow requirements stipulated within the design criteria. Estimated water modeling demands are summarized below in **Table 3**.

Table 3 – Water Modeling Demand Summary

Land Use Description	ADD (L/s)	MDD (L/s)	PHD (L/s)	FF (L/s)
SF / Duplex	2.85	5.70	8.56	60
Townhome	14.60	29.21	43.81	90
Apartment	17.83	35.67	53.50	90
Commercial	0.80	1.59	2.39	150
Civic Centre	0.25	0.51	0.76	150
RES	35.29	70.58	105.86	-
ICI	1.05	2.10	3.14	-
TOTAL	**36.34**	**72.67**	**109.01**	-

Water demands were calculated for each parcel block and assigned to the nearest fronting model junctions using GIS geoprocessing tools. The scope of this current analysis excluded the need for an extended-period simulation; as such, no time series demand patterns were required.

2.1.4. Proposed Water Servicing Plan

The Plan water servicing plan is proposed to serve the projected 5,708 PE and provide redundancy for the neighbouring Village water system. Offsite servicing designs previously discussed in **Section 1.3.1** propose an extension of the existing Metro Vancouver 'Port Moody Main No. 2' supply from its origin at the Coquitlam-Port Moody border to the southern edge of Anmore at the Plan boundary.

Flow and pressure conditions for this proposed feeder main extension were not available at the time of this analysis. As such, the new onsite water servicing system was designed under the assumption that booster pumps, PRVs, and a reservoir located in the northeast portion of the Plan (sizing of the storage facility to be completed under a separate study once detailed design parameters are available) would provide satisfactory residual pressures and required fire flows once connected offsite. The PRV stations will require a minimum of two parallel PRVs for redundancy, with a smaller valve designed for PHD and a larger valve designed for fire flow. At the onsite feeder main connection, the booster pump has been assumed to be capable of discharging 150 L/s (FF) at 125 m of total head; the offsite feeder main must provide at least ~35 m of elevation head to reach the Plan. Additional pressure head and pump depth at this location will determine the available net positive suction head for pump selection during detailed design. Proposed linear and facility water servicing infrastructure is summarized below in **Table 4**. An overview of the proposed water servicing plan is presented in **Figure 4**.

Table 4 – Proposed Water Servicing Infrastructure

Linear Asset	Nominal Size (mm)	Length (m)	Facility Asset	Quantity
Water Main	200	3,460	Reservoir	1
	250	781		
	300	547	[1]Booster Pump	2
	400	2,148	[2]PRV Stations	4

[1]Booster pumps are proposed at the southwest corner of the site on First Avenue and at the intersection of Sunnyside Road and Upper Loop.
[2]Four (4) PRV stations with two (2) PRVs required at each station.

2.1.5. Water Design Considerations

Proposed site topography derived from preliminary grading indicates that the ground elevation for the Plan Area will vary between 32 m and 166 m geodetic. To maintain safe system operating pressures specified by the design criteria, four pressure zones (PZ) were designed by setting PRVs to maintain the HGL across specific service areas. Furthermore, the proposed water system configuration was designed to prevent dead-ends, wherever possible, and create hydraulic redundancy between PZs through looped PRV connection locations.

Land use blocks with residual pressures exceeding 75 psi require individual PRVs to protect the buildings being serviced by the Village water system, per MMCD design criteria requirements. PZ boundaries and total head values were designated with the intention of preventing as many instances of >75 psi pressures as possible. Projected population equivalents and water demands within each proposed PZ are summarized below in **Table 5**. An overview of proposed water PZs within the Plan Area is presented in **Figure 5**.

Table 5 – Population Equivalents and Water Demands by Pressure Zone

Pressure Zone HGL	PE	ADD (L/s)	MDD (L/s)	PHD (L/s)
95m	1,912	12.17	24.34	36.51
125m	1,288	8.63	17.26	25.89
150m	2,024	12.88	25.77	38.65
190m	484	2.65	5.30	7.95
TOTAL	**5,708**	**36.34**	**72.67**	**109.01**

VILLAGE OF ANMORE

Anmore South Neighbourhood Plan

FIGURE 4

Infrastructure Servicing Report
Proposed Water Servicing Plan

LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use
- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve
- Road

Contours
- Minor, 1 m
- Major, 5 m

Water Facility
- PRV
- Reservoir
- Booster Pump

Water Main
- 200 mm
- 250 mm
- 300 mm
- 400 mm

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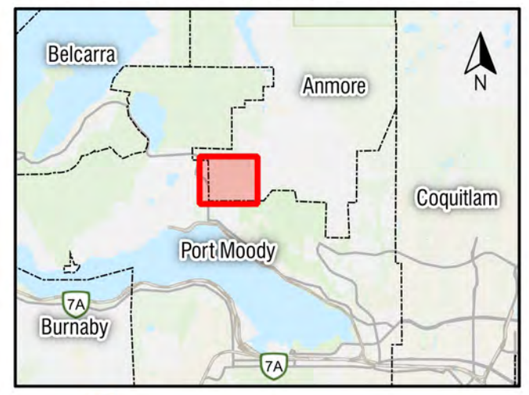

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VILLAGE OF ANMORE

Anmore South Neighbourhood Plan

FIGURE 5

Infrastructure Servicing Report
Proposed Water Pressure Zones

LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Contours
- Minor, 1 m
- Major, 5 m

Water Facility
- PRV
- Reservoir
- Booster Pump

Water Main
- Distribution Main
- Feeder Main

Pressure Zone HGL
- 95 m
- 125 m
- 150 m
- 190 m

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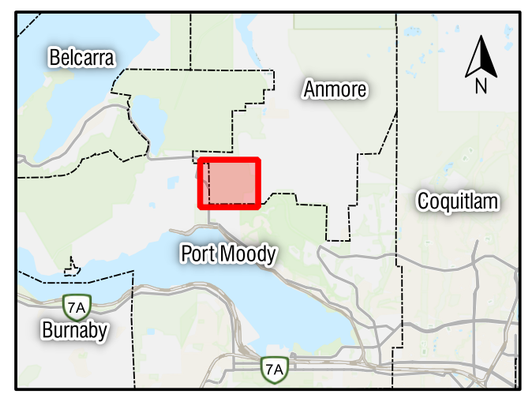

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2.1.6. Water System Hydraulic Analysis Results

The proposed water system for the Plan Area was modeled and analyzed using InfoWater Pro. Water infrastructure within the distribution network was sized to satisfy design criteria for residual pressure, fire flow, and pipe velocity. Analysis results from the required PHD and MDD+FF water demand scenarios are summarized below in **Table 6**.

Table 6 – Water Analysis Results Summary

Parameter		Minimum Value	Maximum Value
PHD Static Pressure		44.24 psi	112.48 psi
PHD Distribution Main Velocity		0.01 m/s	1.11 m/s
MDD+FF Residual Pressure	Single Family & Duplex	35.64 psi	64.15 psi
	Townhouse & Apartment	38.39 psi	75.99 psi
	Commercial	47.83 psi	58.26 psi
MDD+FF Available Fire Flow	Single Family & Duplex	91 L/s	>500 L/s
	Townhouse & Apartment	137 L/s	>500 L/s
	Commercial	266 L/s	336 L/s

PHD model scenario results indicate that the proposed feeder and distribution mains provide sufficient pressure to service the Plan Area under peak hourly demands. The minimum pressure experienced at any model junction was 44.24 psi, above the minimum 44 psi requirement. The maximum modeled pressure of 112.48 psi also satisfies design criteria by remaining well below 123 psi, not requiring additional approval from the Village Engineer. However, six (6) separate land use blocks (multi-family and commercial) experience pressure above 75 psi, thus requiring onsite PRVs at individual building connections. The maximum distribution main velocity of 1.11 m/s is generally considered acceptable (<3.25 m/s).

An overview of the water pressure results under PHD conditions within the Plan Area is presented in **Figure 6**.

MDD+FF model scenario results indicate that the proposed feeder and distribution mains provide sufficient residual pressure to service the Plan Area under land use-specific fire flows. The minimum residual pressure experienced at model junctions was 35.64 psi for single family and duplexes, 38.39 psi for townhouses & apartments, and 47.83 psi for commercial land uses, above the minimum requirement of 22 psi. Maximum modeled residual pressures between 58.26 psi and 75.99 psi also satisfy design criteria by remaining well below 123 m, not requiring additional approval from the Village Engineer.

An overview of the water pressure results under MDD+FF scenario conditions within the Plan Area is presented in **Figure 7**.

MDD+FF model scenario results also indicate that the proposed feeder and distribution mains provide sufficient fire flow to service the Plan under maximum daily demands. The minimum fire flow available at model junctions was 91 L/s for single family and duplex parcels, 137 L/s for townhouses & apartments, and 266 L/s for commercial land uses, above the minimum design requirement of 60 L/s, 90 L/s, and 150 L/s, respectively. Other locations throughout the system can produce over 500 L/s of available fire flow.

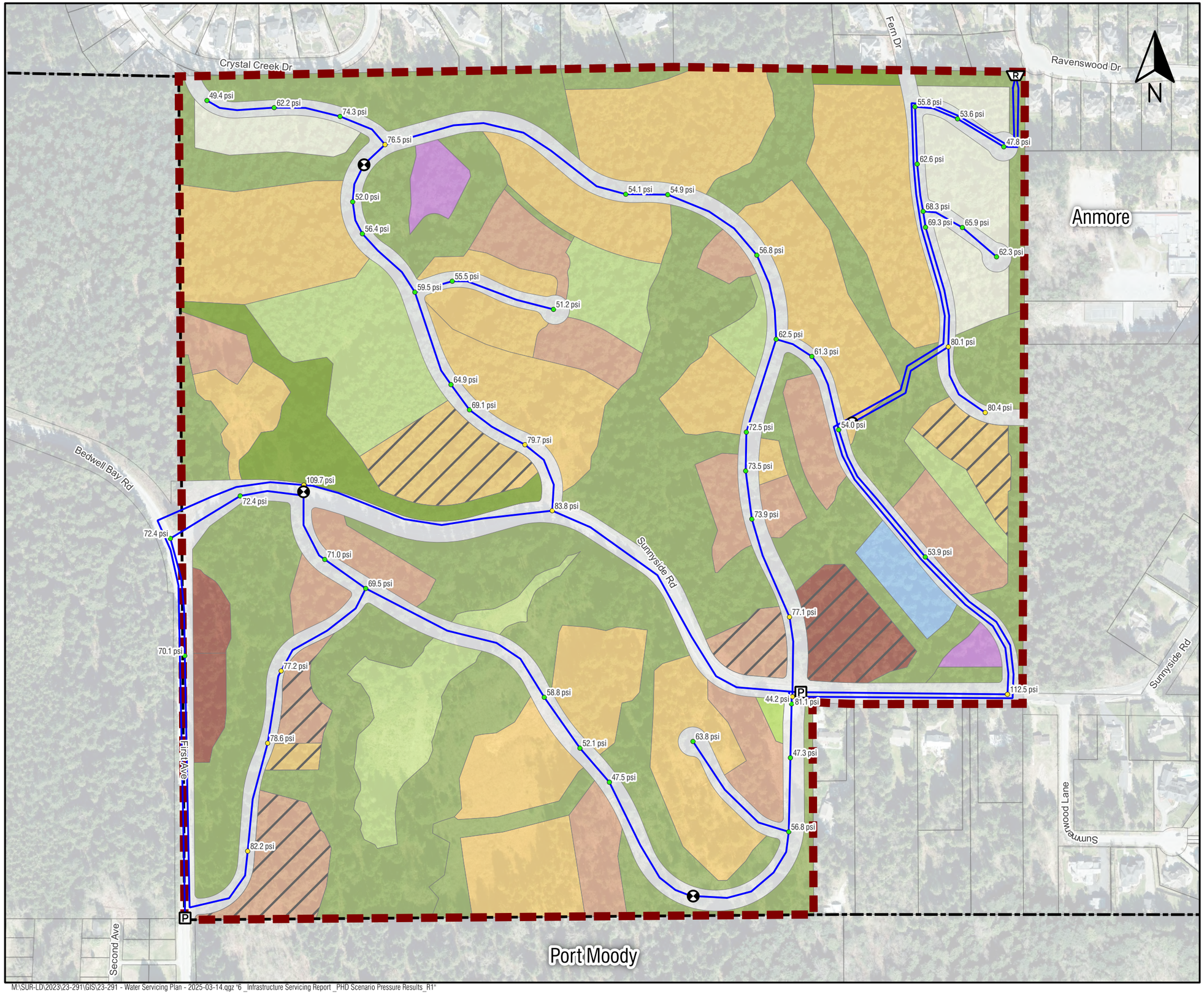
An overview of the water flow results under MDD+FF conditions within the Plan Area is presented in **Figure 8**.

VILLAGE OF ANMORE

Anmore South Neighbourhood Plan

FIGURE 6

Infrastructure Servicing Report
PHD Scenario Pressure Results



LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use
- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve

- Road
- Onsite PRV Required
- Water Main

Water Facility
- PRV
- Reservoir
- Booster Pump

Pressure Results
- 44 psi - 75 psi
- 75 psi - 123 psi

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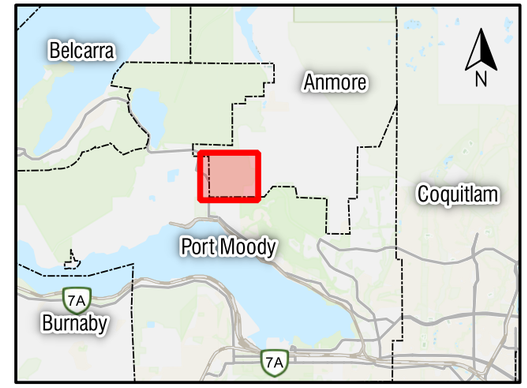

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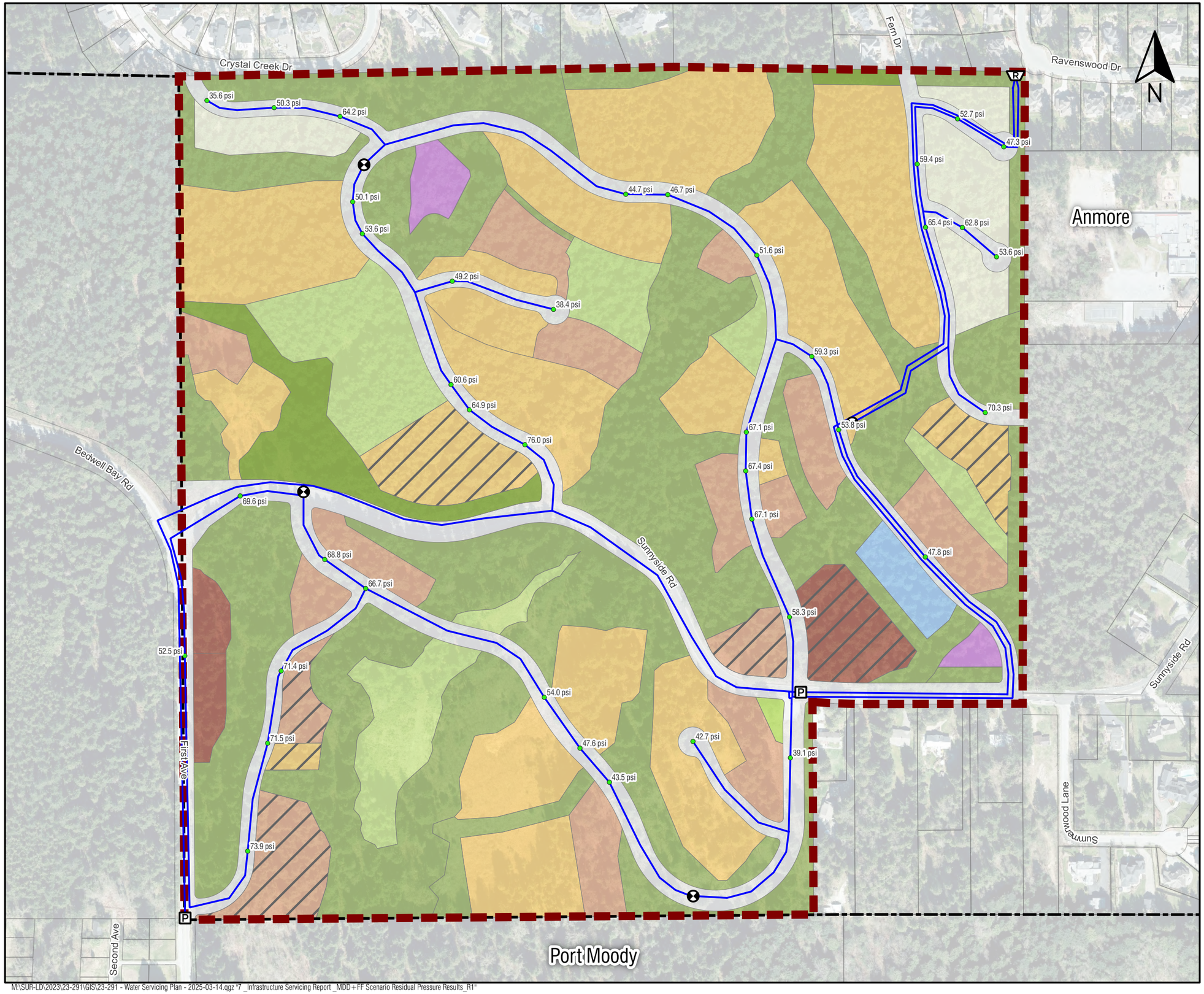
FIGURE 7

Infrastructure Servicing Report
MDD+FF Scenario Residual Pressure Results



LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use
- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve

- Road
- Onsite PRV Required
- Water Main

Water Facility
- PRV
- Reservoir
- Booster Pump

Residual Pressure Results
- >= 22 psi

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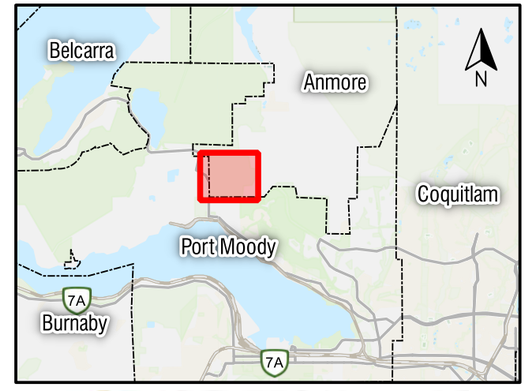

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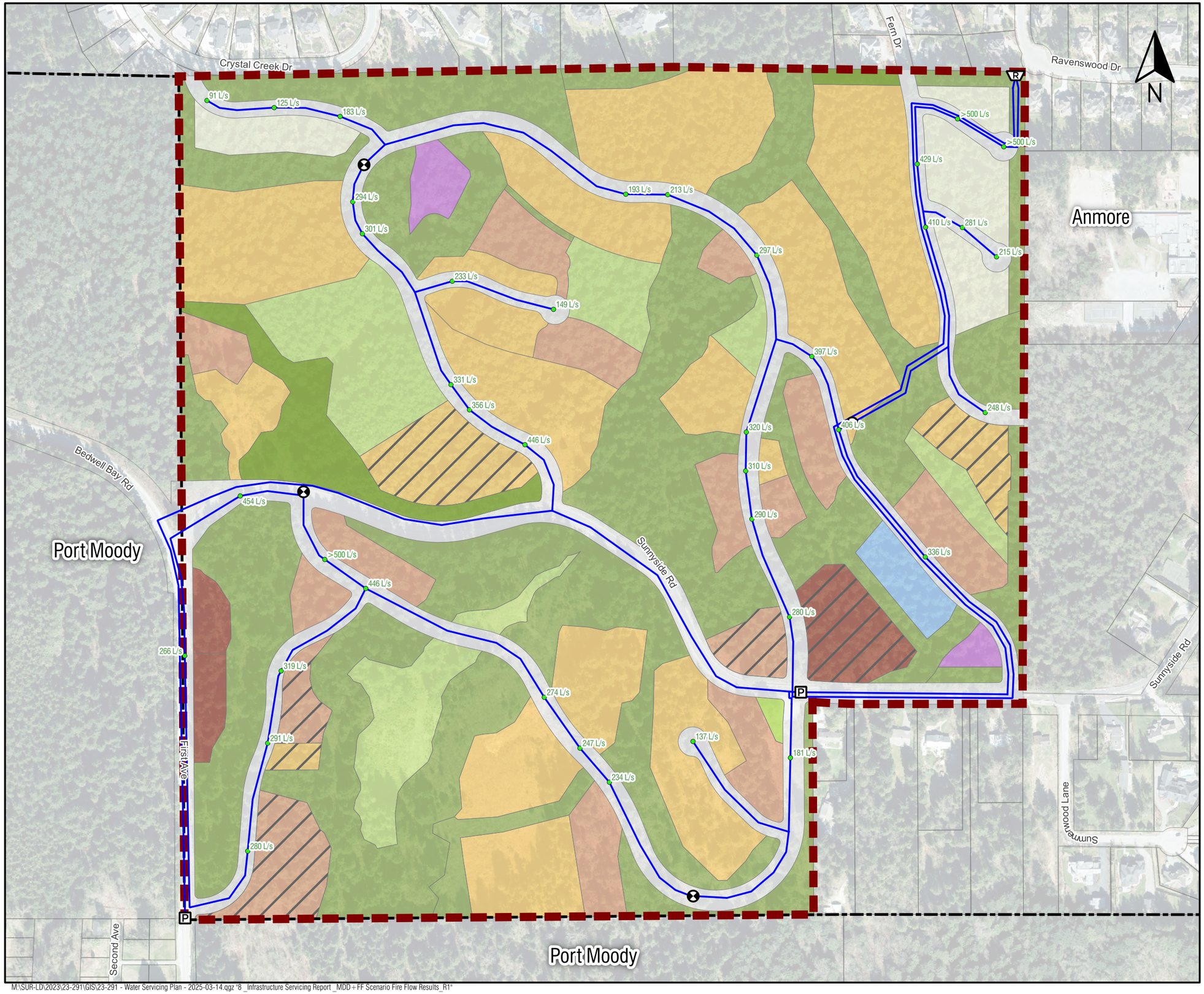

VILLAGE OF ANMORE

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FIGURE 8

Infrastructure Servicing Report
MDD+FF Scenario Fire Flow Results

LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use

- Ground Oriented (60 L/s Req.)
- Multi-Family | Townhome (90 L/s Req.)
- Multi-Family | Apartment (90 L/s Req.)
- Mixed Use (150 L/s Req.)
- Civic | Community Centre (150 L/s Req.)
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve
- Road
- Onsite PRV Required
- Water Main

Water Facility

- PRV
- Reservoir
- Booster Pump

Available Flow

- FF Avail. >= FF Req.

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0 50 100 m

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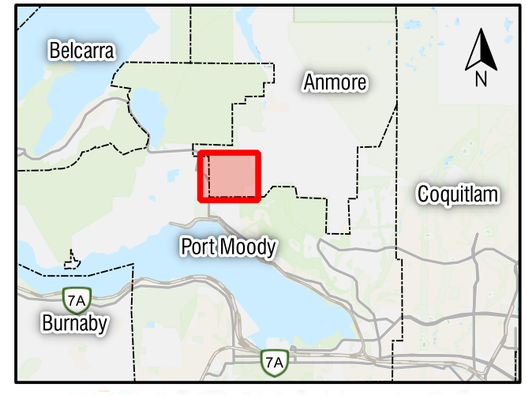

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2.2. Sanitary Servicing

A new sanitary system is proposed for the Plan with the potential for future branch connections at Fern Drive to the north and Sunnyside Road to the east. Due to topographical constraints and the current lack of municipal sanitary infrastructure within the Village, a comprehensive system of gravity mains (including private, strata operated low-pressure mains) along utility easements and public ROWs is planned to service the Plan.

The following subsections present an overview of the existing sanitary system, servicing design criteria, projected loads, proposed servicing plan, design considerations, and system analysis results for the proposed sanitary serving plan.

2.2.1. Existing Sanitary System Overview

Very limited information is available for the Village sanitary system. Asset and operational data are not currently accessible for public review via open data download or published master plans, but only through a web-based GIS viewer maintained by the Village Engineer.

The Village currently does not appear to convey wastewater to any Metro Vancouver trunk interceptor through Port Moody. Several disparate strata sewer segments exist within the Village, indicating the predominant use of privately owned onsite sanitary collection, treatment and dispersal systems in lieu of a municipally owned and operated collection system. Sanitary wet well storage, pumping infrastructure, and trunk tie-in connections do not currently exist within the Village.

Preliminary review of the existing limited sanitary infrastructure indicates that the Plan Area will be the first area within Anmore to receive comprehensive sanitary servicing. It is uncertain whether the Village is planning to provide additional sanitary services and develop a hydraulic modeling; future integration of this plan with a potential Anmore sanitary model is recommended to provide the basis for eventual expansion of services to existing parcels and additional benefits to be identified at the detailed design stage.

2.2.2. Sanitary Servicing Design Criteria

Sanitary main design criteria used for hydraulic analysis and sizing were derived from Village *Subdivision and Development Control Bylaw No. 633-2020, Schedule B – Detailed Design Criteria* and *BC Master Infrastructure Design Guidelines 2022*. Village sanitary design criteria are summarized below in **Table 7**.

Table 7 – Sanitary Design Criteria Summary

Parameter	Design Criteria
Sanitary Loading	
Average Dry Weather Flow (ADWF)	350 Lpcd
Infiltration & Inflow (I&I), Pipes Below GWT Low-Density Areas with Large Lot Frontage	1.0 L/mm Ø/100 m Length/hr
Peaking Factor (PF)	Metro Vancouver-Derived Stock Patterns
Flow Velocity	
Minimum Gravity Main Velocity	0.60 m/s
Minimum Force Main Velocity	0.75 m/s
Pipe Capacity	
Maximum Depth Ratio (d/D)	0.80
Pipe Size	

Parameter	Design Criteria
Collector Main	200 mm Ø and larger
Other	
Manning Roughness Coefficient, n	0.013 for All Gravity Mains
Hazen-Williams Roughness Coefficient, C	120 for All Force Mains
Minimum Gravity Main Grade	Any Grade Achieving 0.60 m/s or 0.60% for Upstream Service of 25 PE or Less
Minimum Force Main Grade	0.1 %
Maximum Depth of Cover	4.50 m

2.2.3. Projected Sanitary Loads

Sanitary loads projected for the Plan were estimated based on proposed land use PE yields and the Village design criteria. For sanitary system analysis, the Plan Area was divided into land use subcategories for per-capita load requirement per the design criteria. Estimated sanitary modeling loads are summarized below in **Table 8**.

Table 8 – Sanitary Modeling Load Summary

Land Use Description	ADWF (L/s)	PDWF (L/s)	[1]I&I (L/s)
SF / Duplex	1.81	3.45	-
Townhome	9.29	17.66	-
Apartment	11.35	21.56	-
Commercial	0.51	0.96	-
Civic Centre	0.16	0.31	-
RES	**22.46**	**42.67**	**-**
ICI	**0.67**	**1.27**	**-**
TOTAL	***23.12***	***43.93***	***3.18***

[1]Infiltration & Inflow calculated by pipe length.

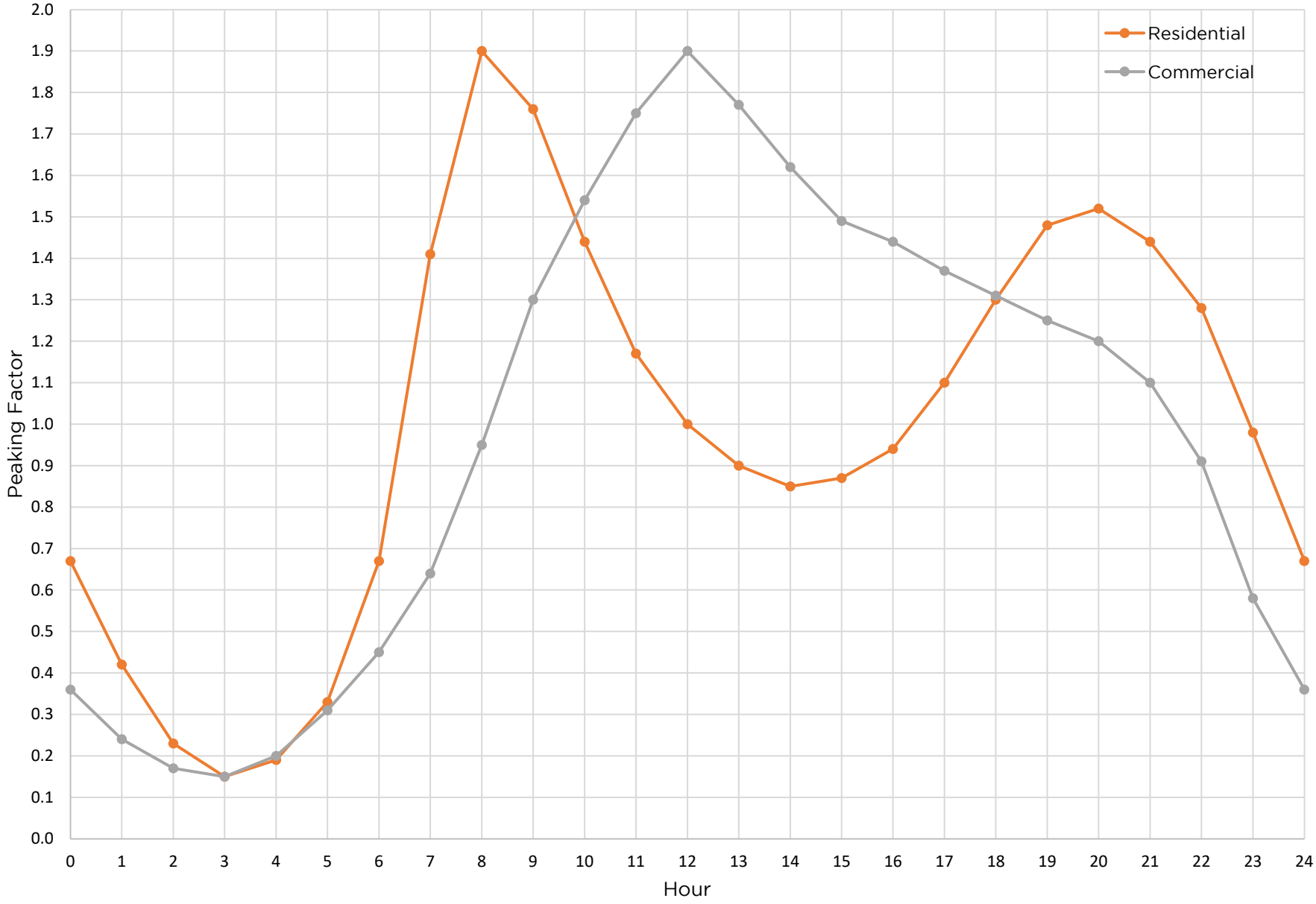
Sanitary loads were calculated for each parcel block and assigned to the nearest fronting upstream model junction.

The scope of this current analysis requires at least 24 hours of continuous simulation timesteps to accurately anticipate daily sanitary system performance. MMCD design criteria recommends that time series diurnal peaking factors (PFs) be used for sanitary hydraulic modeling, ideally based on local flow data and reflective of land-use customer classes. However, the lack of municipally operated sanitary services within the Village precludes the derivation and subsequent use of local diurnal patterns.

In lieu of Anmore-specific diurnal sanitary data, modeling was performed using stock PF hourly patterns aggregated from analyses within other Metro Vancouver member municipalities. These patterns must be reviewed (and revised, if necessary) for approval by the Village Engineer.

Stock peaking factors for residential and commercial land uses within Metro Vancouver are presented in **Figure 9**.

Figure 9 - Metro Vancouver Stock Hourly Peaking Factors



2.2.4. Proposed Sanitary Servicing Plan

The sanitary servicing plan for the Plan is proposed to service the projected 5,708 PE and provide potential for Village sanitary system expansion into neighbouring areas. Offsite servicing designs previously discussed in **Section 1.3.1** propose an extension of the existing Port Moody 450 mm Ø trunk main from Ioco Road along 1 Ave to the southern edge of Anmore at the Development site boundary.

The new onsite sanitary servicing system is assumed to be with a normal/free outfall HGL condition at the trunk tie-in without experiencing backwater effects from downstream pipes based on the steep existing grades along 1 Avenue. The proposed linear and facility sanitary servicing infrastructure are summarized below in **Table 9**.

Table 9 – Proposed Sanitary Servicing Infrastructure

Linear Asset	Nominal Size (mm)	Length (m)	Facility Asset	Quantity
Gravity Main, Polyvinyl Chloride (PVC)	200	2,653	Standard Manhole	91
	250	1,407		
	300	312	Trunk Outfall Manhole	1
	375	427		

An overview of the proposed sanitary servicing plan is presented in **Figure 10**.

2.2.5. Sanitary Design Considerations

In order to maintain gravity flow wherever possible, utility easements are proposed to follow surface grades and prevent excessive pipe cover depths. Invert drops at each gravity manhole were assumed to be 60 mm. Several land use blocks will require strata low-pressure systems to convey sanitary loads uphill to the nearest gravity manhole tie-in. All low-pressure mains are subject to approval by the Village Engineer per design criteria requirements.

Low-density residential land use blocks at the upstream-most areas of the Plan Area have been designed with steep slopes intending to produce self-cleansing velocities in spite of little anticipated flow. Other pipe segments further downstream experience higher flow but have been designed at a minimum 0.60% slope to allow for design flexibility at later stages of detailed design and improved constructability. Service connections have not been considered for this current scope of analysis, with the exception of assumed length and diameter I&I contributions.

An overview of proposed sanitary pipe slopes within the Plan Area is presented in **Figure 11**.

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Anmore South Neighbourhood Plan

FIGURE 10

Infrastructure Servicing Report
Proposed Sanitary Servicing Plan

LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use
- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve
- Road

Contours
- Minor, 1 m
- Major, 5 m

Sanitary Facility
- Trunk Tie-In
- Manhole

Sanitary Main
- 200 mm
- 250 mm
- 300 mm
- 375 mm
- Low Pressure Sewer

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0 50 100 m

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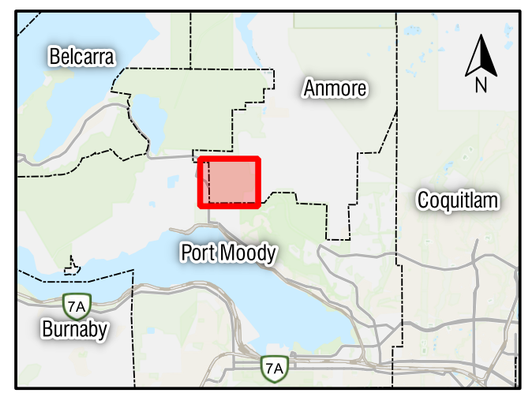

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FIGURE 11

Infrastructure Servicing Report
Proposed Sanitary Pipe Slopes

LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use
- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve
- Road

Contours
- Minor, 1 m
- Major, 5 m

Sanitary Facility
- Trunk Tie-in
- Manhole

Pipe Slope
- < 1.0%
- 1.0% - 2.0%
- 2.0% - 5.0%
- 5.0% - 10%
- > 10%
- Low Pressure Sewer

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0 50 100 m

Scale: 1:3500 (11"x17" Print Only)
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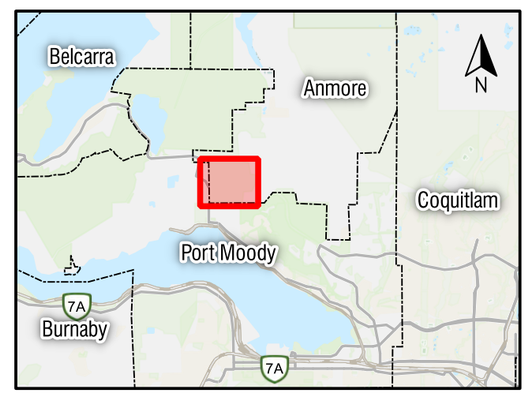

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Port Moody Trunk Extension
Tie-in Invert Assumed at 29.28m

2.2.6. Sanitary System Hydraulic Analysis Results

The proposed sanitary system servicing the Plan Area was modeled and analyzed using EPA SWMM 5.1.015 within the PCSWMM software package. Sanitary infrastructure within the conveyance network was sized to satisfy design criteria for pipe slope, cover depth, depth capacity, flow capacity, and sewer main velocity. Analysis results from the required PWWF sanitary load scenario are summarized below in **Table 10**.

Table 10 – Sanitary Analysis Results Summary

Parameter	[1]Minimum Value	Maximum Value
Flow Capacity, q/Q	<0.01	0.23
Depth Capacity, d/D	0.02	0.33
Gravity Main Velocity, m/s	0.59	2.55

[1]Only one gravity main has a velocity less than 0.60 m/s. The pipe velocity is within 2% of the design requirement therefore no further changes are recommended.

Please note that the low-pressure sewer was not modeled as part of this analysis.

PWWF model scenario results indicate that the proposed gravity main system provides sufficient flow and depth capacity to service the Plan Area under peak wet weather loads. The maximum modeled actual-to-max flow ratio of 0.23 and depth ratio of 0.33 were both well below the 0.80 required to satisfy design criteria. The minimum modeled flow ratio of <0.01 and depth ratio of 0.02 were both experienced at several upstream branch end locations.

An overview of the sanitary flow and depth capacity results under PWWF scenario conditions within the Plan Area is presented in **Figure 12** and **Figure 13**, respectively**.**

PWWF model scenario results also indicate that the proposed gravity main system provides sufficient minimum velocities to service the Plan Area under peak wet weather loads. The minimum peak flow velocity experienced along any gravity main was 0.59 m/s, which is within 2% of the 0.60 m/s requirement. The maximum modeled peak flow velocity of 2.55 m/s does not require any additional pipe erosion mitigation measures.

Due to topographic constraints, low-pressure systems will be required to service several land use blocks which cannot be connected to the downstream system via gravity flow. It is proposed that the Village Engineer waive the minimum velocity requirement for low-pressure mains and provide feedback for acceptable mitigation measures to be developed at the detailed design stage, in lieu of satisfying this particular design criterion.

An overview of the sanitary maximum velocity results under PWWF scenario conditions within the Plan Area is presented in **Figure 14**.

VILLAGE OF ANMORE

Anmore South Neighbourhood Plan

FIGURE 12

Infrastructure Servicing Report
PWWF Scenario Flow Capacity Results

LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use

- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve
- Road

Sanitary Facility

- Trunk Tie-in
- Manhole

Pipe Flow Capacity (q/Q)

- 0.20 - 0.40
- < 0.20
- Low Pressure Sewer

Port Moody Trunk Extension
Tie-in Invert Assumed at 29.28m

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0 50 100 m

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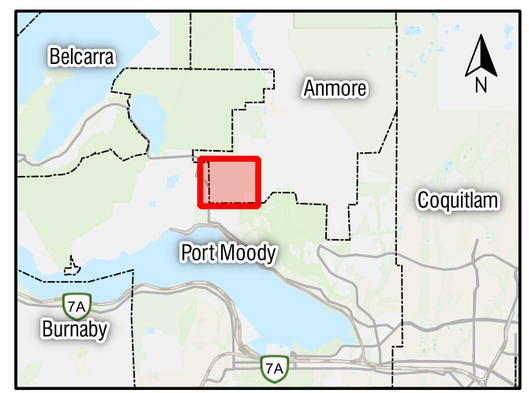

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FIGURE 13

Infrastructure Servicing Report
PWWF Scenario Flow Depth Results

LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use

- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve
- Road

Sanitary Facility

- Manhole
- Trunk Tie-in

Pipe Flow Depth (d/D)

- 0.20 - 0.40
- < 0.20
- Low Pressure Sewer

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0 50 100 m

Scale: 1:3500 (11"x17" Print Only)
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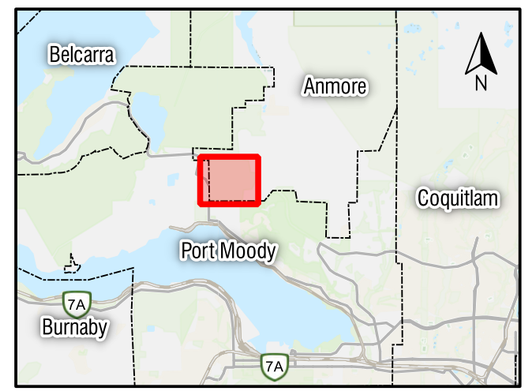

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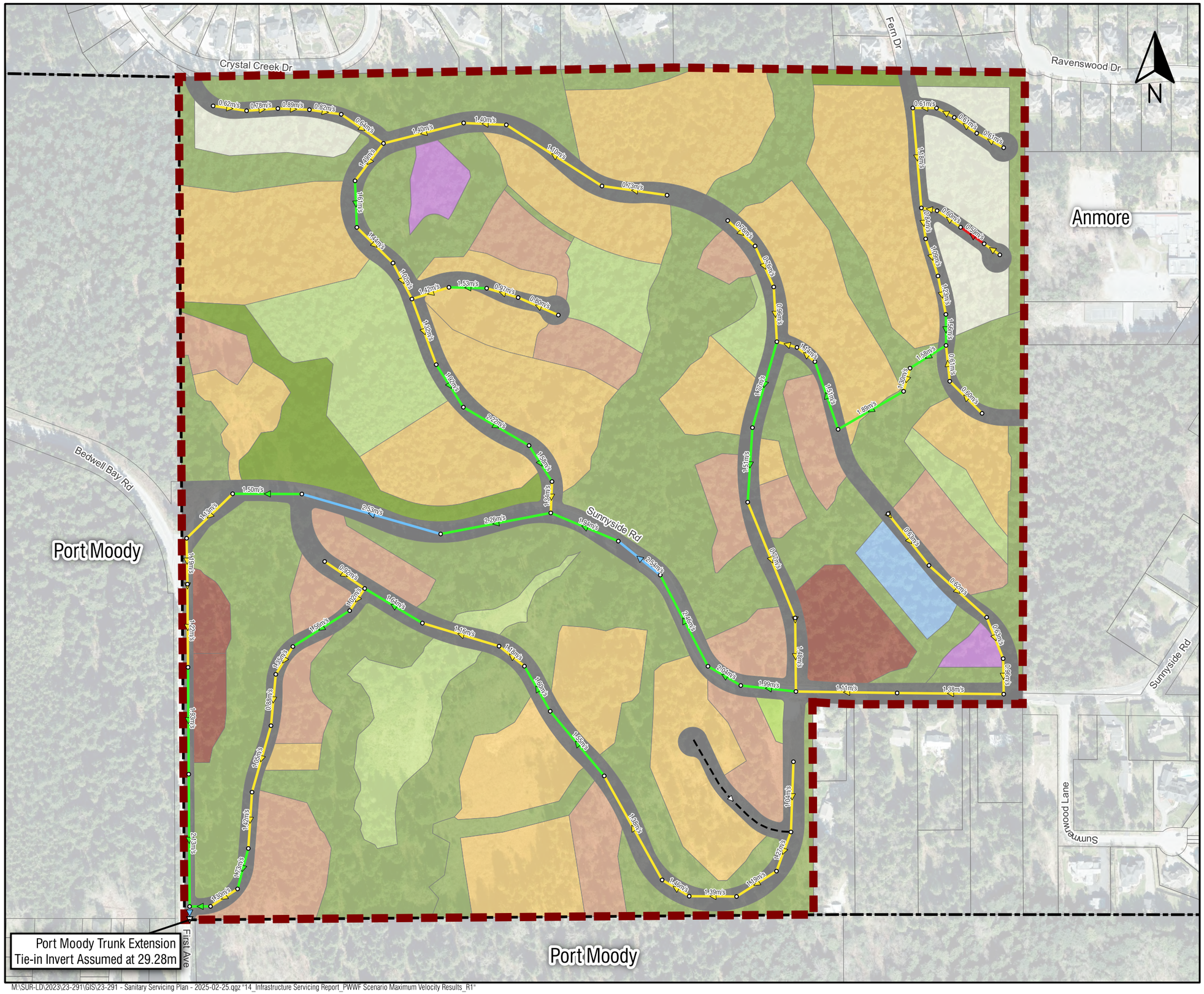
Port Moody Trunk Extension
Tie-in Invert Assumed at 29.28m



VILLAGE OF ANMORE

Anmore South Neighbourhood Plan

FIGURE 14

Infrastructure Servicing Report
PWWF Scenario Maximum Velocity Results

LEGEND

- Municipal Boundaries
- Existing Parcels
- Site Boundary

Proposed Land Use

- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Protected Natural Area + Greenways
- Neighbourhood Park
- Civic | Development Reserve
- Road

Sanitary Facility

- Trunk Tie-in
- Manhole

Pipe Maximum Velocity

- < 0.60 m/s
- 0.60 m/s - 1.50 m/s
- 1.50 m/s - 2.50 m/s
- 2.50 m/s - 3.50 m/s
- Low Pressure Sewer

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Revision:	2
Date:	2025-03-14

0 50 100 m

Scale: 1:3500 (11"x17" Print Only)
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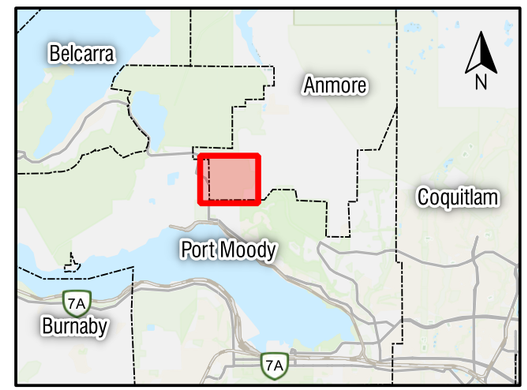

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2.3. Drainage Servicing

2.3.1. Existing Drainage Overview

The Plan Area currently has an undeveloped natural forest setting with ground elevations ranging from 25 m to 160 m geodetic. The terrain generally slopes from northeast to southwest at approximately 10%.

Stormwater mainly runs overland and drains into Doctor's Creek, Schoolhouse Creek, and their tributaries. These watercourses leave the Plan Area at four distinguished outflow locations (also referred as control points), and continue running south and ultimately into the Burrard Inlet. Besides surface runoff, flows in these watercourses also appear being contributed by seepage water from subsurface. The site is bisected by Sunnyside Road, with existing culverts conveying tributary flows across the road.

The EIA (see **Section 1.3.2**) identified tributaries south of Sunnyside Road as fish-bearing with good potential for habitat rehabilitation.

Based on the preliminary Geotechnical review referred in **Section 1.3.3**, the Plan Area is underlaid by up to 0.6 m of topsoil, over 2 m of post glacial sand over dense silty sand and glacial till. The post glacial sand layer consists primarily of moderately well-drained silt loam and well-drained sandy loam soils. These soil types present opportunities for infiltration where sufficient thickness of unsaturated, loose, granular material exists. However, the groundwater level could also be near the surface in some locations, limiting infiltration capacities in certain areas.

The aquifer information from the BC Water Resource Atlas website shows the southeast portion of the Plan Area is within the mapped extent of a confined aquifer, Aquifer 924. This aquifer is comprised of glaciofluvial sand and gravel underneath glacial till. The static groundwater level of Aquifer 924 is approximately 27.4 m below grade, according to the well log information for a registered well near the site. Near surface groundwater noted in certain areas could be due to perched groundwater or precipitation accumulation above the confined aquifer.

The drainage catchment for the drainage analysis is delineated based on the tributary areas to the four control points, as shown in **Figure 15**. Please note **Figure 15** also presents the post-development drainage catchment plan to compare with the existing catchment plan, showing how the major catchment areas draining to the four control points are to be altered with the proposed drainage servicing concept. **Table 11** summarizes the pre- and post-development catchment areas to the control points.

Table 11 –Tributary Catchment Data

Control Point/Tributary Catchment ID	Watercourse Name	Pre-Development Catchment Area (ha)	Post-Development Catchment Area (ha)
1	Doctor’s Creek	31.6	30.5
2	Schoolhouse Creek North	62.1	63.1
3	Schoolhouse Creek Tributary 5 (S-Trib-5)	32.8	32.8
4	Schoolhouse Creek Tributary 2 (S-Trib-2)	26.7	23.7

VILLAGE OF ANMORE

ANMORE SOUTH NEIGHBOURHOOD PLAN

FIGURE 15

Infrastructure Servicing Report
Tributary Catchment Area Plan

LEGEND

- Municipal Boundaries
- Existing Parcels
- Private Development / Public ROW, Easement

Existing Contours
- Minor, 1m
- Major, 5m

Proposed Contours
- Minor, 1m
- Major, 5m

Site Boundary

Tributary Catchment IDs
- 1
- 2
- 3
- 4

Bankline (Approximate)

15m Buffer Extent

Wetland Extent

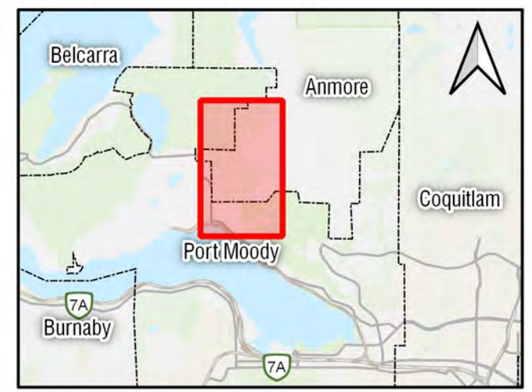
Existing Catchments

Proposed Catchments

Proj. No:	23-291
Creator:	GHL
Reviewer:	WY
Revision:	1
Date:	2025-03-14

0 150 300 m

Scale: 1: (11"x17" Print Only)
Coordinate System: EPSG:26910 - NAD83 / UTM zone 10N



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2.3.2. Stormwater Management Design Criteria

The design criteria for the proposed stormwater management system are derived according to Village of Anmore's *Subdivision and Development Control Bylaw No. 633-2020, Schedule B - Detailed Design Criteria* and incorporates watershed-specific objectives as listed below:

1. **Maintain Existing Hydrological Regime**

   Configure post-development catchment areas to approximate pre-development drainage patterns and avoid large-scale diversions or flow disruptions. This approach preserves natural hydrology and supports continued health of receiving streams.

2. **Protect Fish and Fish Habitat**

   Maintain baseflow and water quality with onsite and offsite Low Impact Development (LID) source control measures. Design requirements for the LIDs include:

   - On-site infiltration and retention facilities sized to capture the 6-month 24-hour rainfall amount
   - Water quality treatment to the 6-month 24-hour event runoff flow in both development areas and roadways
   - Apply 10 to 15 m riparian setbacks along existing watercourses as per the EIA recommendations

3. **Minimize Stream Erosion**

   Protect stream channels from erosion by controlling post-development peak flows to the pre-development levels under frequent storm events. The detention and flow control design are to be incorporated into the onsite LID design to meet the following requirement:

   - Control post-development peak flows to match pre-development forested conditions for events up to the 1:5-year return period

4. **Prevent Frequent Flooding and Ensure Safe Conveyance of All Flows**

   Design storm sewers to minimize inconvenience with surface runoff under frequent events and allow for safe conveyance of major event runoff and no damage to life and property under extreme flood conditions. Design requirements include:

   - Minor drainage system (including pipes and culverts) is to convey the 1:10-year return period storm under free flow conditions
   - Major conveyance system (including road crossings, overland flow paths, and stream channels) is to safely transport flows up to the 1:100-year return period.

In addition to the above design criteria determined to achieve specific stormwater management objectives, Schedule B of the Village's Bylaw No. 633-2020 also stipulates the following drainage infrastructure design requirements:

- Minimum Pipe Size
  - Gravity Main: 300 mm diameter
  - Catch Basin Lead: 150 mm diameter (Double)
  - Culvert: 450 mm diameter
- Manning's Roughness Coefficient (n): 0.013
- Minimum Main Grade
  - Pipes greater than 525 mm diameter: 0.25%
  - Pipes less than 600 mm diameter: 0.10%
- Minimum Velocity: 0.6 m/s

It should be noted that all work involving modifications to watercourses shall comply with the BC *Water Sustainability Act* prior to final approval and construction.

2.3.3. Drainage Servicing Strategy

A comprehensive drainage system is proposed to service future development parcels in the Plan Area. This system will integrate with the existing natural drainage network while implementing measures to maintain the area's hydrological regime and ecological health.

The strategy includes both conventional infrastructure and sustainable drainage approaches:

Infrastructure Components

- Underground storm mains (minor system)
- Upgraded culverts under Sunnyside Road and new culverts at the proposed new road crossings
- Engineered overland flow paths for major flow events

The infrastructure components shall be designed for safe conveyance of stormwater runoff throughout the Plan Area.

Low Impact Development (LID) Measures:

- On-lot water quality, quantity and rate control structures
- Bioswales for roadway drainage

Infiltration shall be incorporated into the LID design where soil conditions permit. The LID measures aim to achieve flow control, volume reduction, and water quality enhancement to minimize impacts of the Plan on the receiving waterbodies.

2.3.4. Proposed Drainage Servicing Plan

A detailed drainage servicing plan has been developed for the Plan based on the drainage service strategy (see **Section 2.3.3**) and stormwater management requirements (see **Section 2.3.2**). This plan preserves the pre-development drainage pattern by carefully regrouping catchment directions to the existing watercourses to match pre-development conditions. Refer to **Table 11** showing the pre and post catchment areas to the control points. Parcels adjacent to watercourses are also proposed to drain directly to these channels after LID measures applied, rather than to storm sewers.

The servicing plan integrates new drainage infrastructure with existing natural drainage watercourses as illustrated in **Figure 16**.

Key components of the servicing plan include:

- New Storm sewers ranging from 300 mm to 450 mm in diameter
- Upgraded culverts along Sunnyside Road and new culverts at proposed road crossings (ranging from 750 mm diameter circular to 1.5 m x 2.4 m box culvert)

All infrastructure sizing was determined through comprehensive hydrological and hydraulic modelling (see **Section 2.3.6** for modelling details). It is worth noting that in the EIA, AquaTerra recommended the proposed watercourse crossings be designed with appropriate structure to minimize habitat impacts and provide wildlife movement corridors. However, at the current planning stage, the culverts with the sizes proposed to meet the hydraulic conveyance required are assumed to be suitable for use in the servicing plan. The design for these crossings should be further reviewed with the environmental consultant in the detailed design to confirm the design needs for environmental protection. **Table 12** provides a summary of proposed drainage works.

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ANMORE SOUTH NEIGHBOURHOOD PLAN

FIGURE 16

Infrastructure Servicing Report
Proposed Drainage Servicing Plan

LEGEND

- Municipal Boundaries
- Existing Parcels

Contours
- Minor, 1m
- Major, 5m

- Greenspace
- ROW / Easement
- Site Boundary

Land Use
- Ground Oriented
- Multi-Family | Townhome
- Multi-Family | Apartment
- Mixed Use
- Civic | Community Centre
- Neighbourhood Park
- Protected Natural Area + Greenways
- Road / Utility ROW

Drainage Facility
- Standard Manhole
- Main Outfall

Drainage Mains
- 300mm PVC
- 375mm PVC
- 450mm PVC
- Culvert (Circular CSP, Box CONC)
- Bankline (Approximate)
- 15m Buffer Extent
- Wetland Extent

0 50 100 m

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Reviewer: WY
Revision: 1
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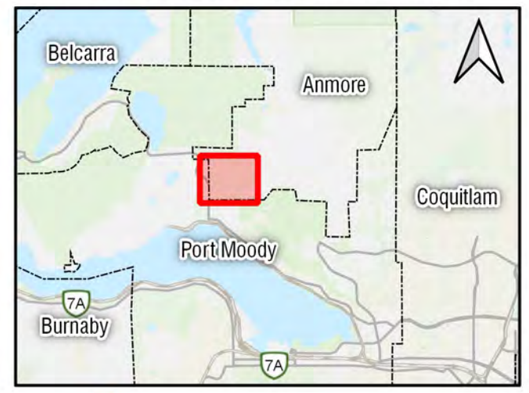

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Table 12 – Proposed Drainage Infrastructure

Linear Asset	Nominal Size (mm)	Length (m)	Facility Asset	Quantity
Minor System				
Gravity Main, PVC	300	3154	1050 mm	65
	450	524		
Major System				
Pipe Culvert, CSP	750	156	Headwall (Including Riprap Armouring)	28
	1200	85		
Box Culvert, Concrete	1200 × 1500	128		
	1200 × 1800	134		
	1200 × 2400	33		
	1500 × 2400	43		

It is worth noting that the proposed drainage servicing plan was derived based on the following onsite and offsite source control design requirements:

For Single-Family Parcels

- Pervious areas shall be covered with a minimum 300 mm amended topsoil layer and vegetation
- Roof leaders shall discharge directly to pervious areas
- All impervious surfaces (walkways, driveways, and other paved areas) shall be graded to drain toward pervious areas
- Lawn catch basins shall be installed to collect drainage from single-family parcels

For Multi-Family Parcels

- Bio-infiltration/detention facilities (rain gardens, bioswales, etc.) shall be used for stormwater source control
- These LID facilities shall be designed to:
  - Capture and treat the 6-month 24-hour rainfall event
  - Provide additional detention volume with controlled release to meet the 1:5-year pre-development flow target
- LID design parameters:
  - Location: Downslope of proposed building(s)
  - Area: 5% of the total impervious area
  - Depth: 1.1 m total (0.4 m for retention, 0.5 m for detention, 0.2 m for overflow)
  - Flow Release Rate: 0.032 $m^3/s/ha$

  The LID design parameters were determined through hydrological/hydraulic modeling to prevent increases in the peak 5-year flows at the four control points.

- Discharge from LIDs shall connect to the proposed storm sewer fronting the multi-family site or, for parcels adjacent to watercourses, drain overland to the stream
- All pervious areas shall also receive 300 mm amended topsoil and appropriate vegetation

For Road Right-of-Ways

- All pervious areas shall receive a minimum 300 mm amended topsoil layer with grass and vegetation with bio-swales may be incorporated into the road boulevard design
- Impervious road and walkway surfaces shall be graded to drain toward pervious areas
- Catch basins shall be installed in boulevard areas to collect excess runoff that cannot infiltrate

Please note storm sewers have been omitted from select road sections that meet both of the following criteria:

1. adjacent to undeveloped natural areas or stream banks
2. not receiving runoff from developed parcels

In these locations, road surfaces shall be graded toward undeveloped shoulders to allow natural drainage to nearby watercourses, minimizing infrastructure while maintaining appropriate stormwater management.

2.3.5. Hydrological & Hydraulic Modelling

Model Development

The PCSWMM program was used to model and analyze the existing and proposed drainage systems and size the required onsite LID design parameters and offsite drainage infrastructure. The area included in modelling covers catchments to the four downstream control points as shown in **Figure 15** under both the pre- and post-development conditions within the Plan Area.

Pre-development hydraulic model components were developed from LidarBC digital elevation model open data and supplemented with topographic survey information. Subcatchments within the study catchment area were allocated to upstream conduit nodes based on elevation contours, and imperviousness percentages were assigned based on zoning designations and orthophoto review. **Figure 16** shows the pre- and post-development model schematics.

Design Storm Data

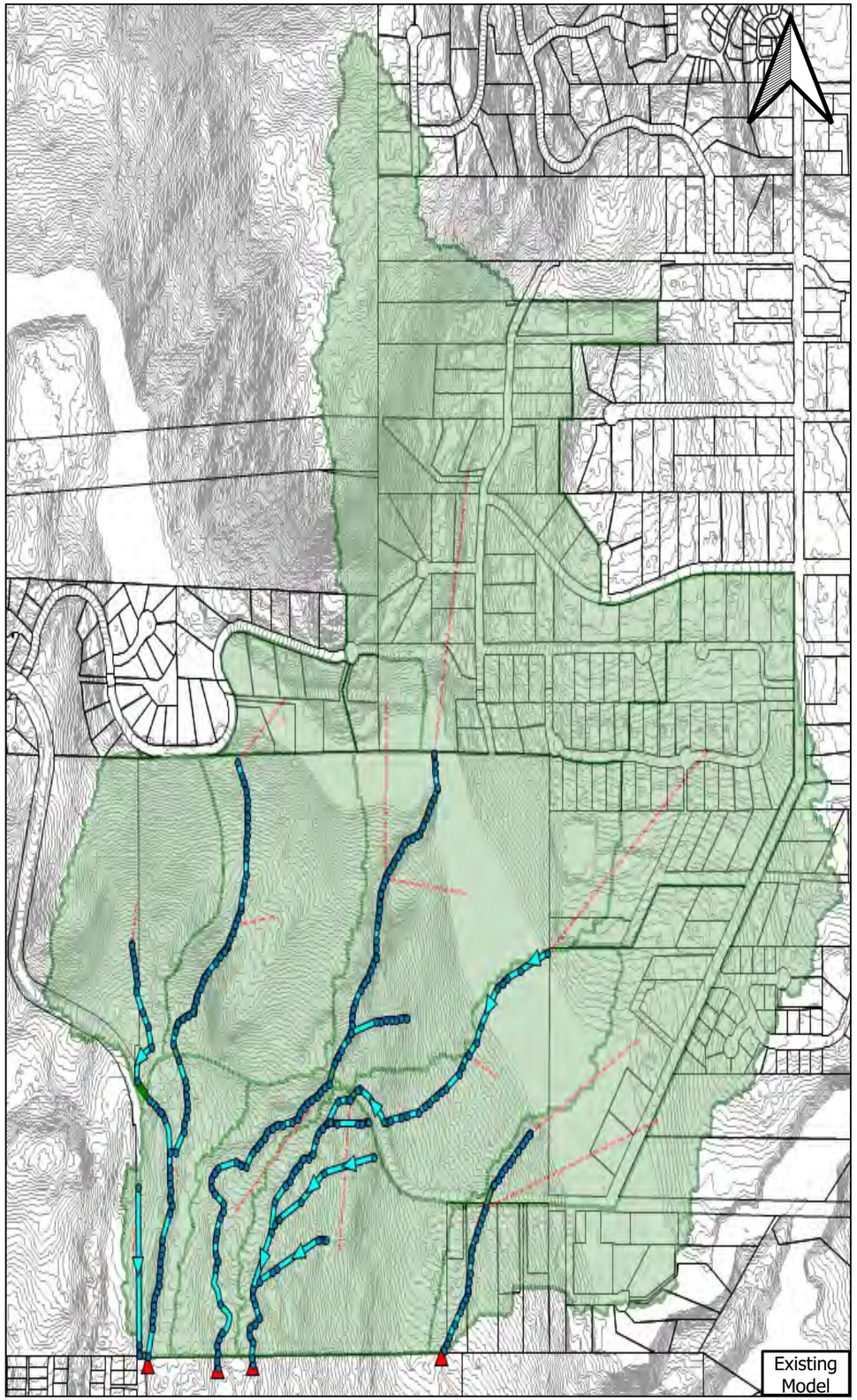
Since the Village's Bylaw No. 633-2020 does not specify design storms in the drainage design criteria. Aplin Martin selected design storms from the City of Coquitlam's Design Criteria Manual for Rainfall Zone 5, which closely approximates the project site location. The 2050 climate condition was incorporated in sizing the drainage infrastructure to account for future rainfall pattern changes.

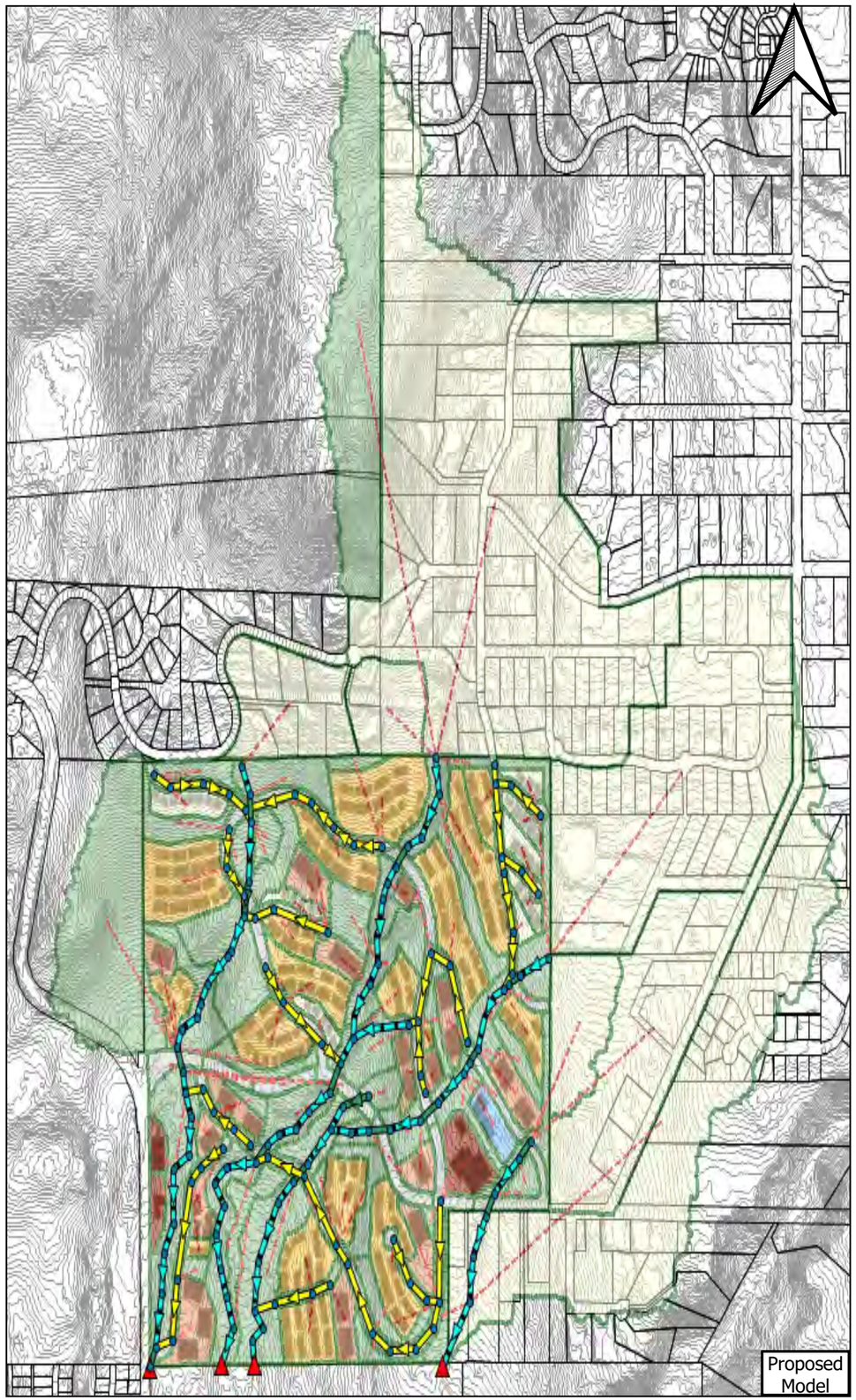
Modelling Scenarios and Parameters

Modelling scenarios and their associated design storm events were selected as shown in **Table 13**. For the 5-year event modelling, the proposed on-lot LIDs were included to properly size detention facilities and flow control designs. However, when sizing storm sewers and culverts, the on-lot LIDs were assumed to be inactive, providing a conservative approach to conveyance infrastructure sizing.

Table 13 – Drainage Model Scenarios

Development Condition	Climate Condition	Source Control	Design Storms	Purpose
Pre-Development	Current	No	5 year 1-hour to 24-hour events	Define flow control targets
Post-Development	2050	Yes	6-month 24-hour event	Confirm rainfall capture target achieved
Post-Development	2050	Yes	5 year 1-hour to 24-hour events	Define future performance of post-development conditions under existing climate with source control
Post-Development	2050	No	10-year 1-hour to 24-hour events	Size proposed storm sewers
Post-Development	2050	No	100-year 1-hour to 24-hour events	Assess flooding in the stream channels and size culverts





VILLAGE OF ANMORE

ANMORE SOUTH NEIGHBOURHOOD PLAN

FIGURE 17

Infrastructure Servicing Report
SWMM Model Elements & Connectivity

LEGEND

- Municipal Boundaries
- Existing Parcels
- Private Development / Public ROW, Easement
- Site Boundary

SWMM Model Element
- Sewer
- Culvert
- Watercourse

Subcatchments
- Junctions
- Outfalls
- Allocation Lines

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0 75 150 m

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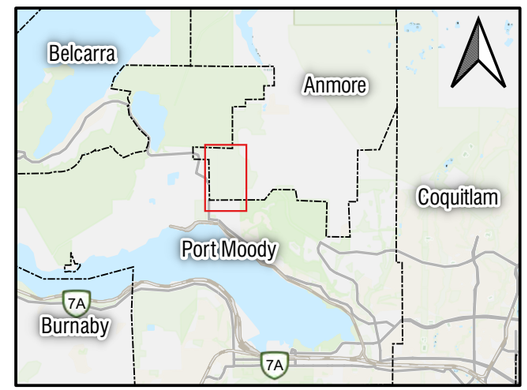

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SWMM modelling parameters were selected based on site soil conditions, land cover characteristics, and professional experience with similar modelling scenarios. These parameters are summarized in **Table 14**.

Table 14 –SWMM Modelling Parameters

SWMM Model Parameters		
Global Parameters	**Depression Storage, mm**	
	Impervious	0.5
	Pervious	5.0
	Manning's n	
	Impervious	0.015
	Pervious	0.250
Roughness Parameters	**Manning's n**	
	- Grassed Ditch	0.040
	- PVC Pipe	0.013
Green-Ampt Infiltration Parameters	Suction Head (mm)	5
	Conductivity (mm/hr)	20
	Initial Deficit (frac.)	0.050
Imperviousness, %	Road ROW	80
	Development Parcels	As per the preliminary land use concept
	Park/ Natural	5
Flow Routing and Routing Percentage	Road ROW	Impervious to Pervious, 100%
	Single Family Parcels	Impervious to Pervious, 100%
	Multi-Family, Mixed Use, Civic/Community Centre Parcels (To Storm Sewer)	Impervious to LID, 100% LID and Pervious to Outlet, 100%
	Multi-Family, Mixed Use, Civic/Community Centre Parcels (To Local Streams)	Impervious to LID, 100% LID to Pervious, 100% Pervious to Outlet, 100%
	Park/ Natural	Impervious to Pervious, 100%

6-Month 24-Hour Event Post-Development Modelling Results

Modelling performed under the post-development 2050 climate 6-month 24-hour event condition shows no drainage outflow from the proposed development parcels, indicating the rainfall under this event would all be captured onsite once these lands are developed.

5-Year Events Modelling Results

Table 15 presents the modelled pre- and post-development 5-year peak flows at the downstream control points, demonstrating the effectiveness of the proposed onsite LID design. The results indicate that post-development 5-year peak flows at these downstream control points are roughly match pre-development peaks. The overall post-

development peak 5-year flow rate is 1.9% (or 0.23 m^3/s) less than the pre-development rate with about 13% (0.32 m^3/s) reduction to the peak flow in Doctor's Creek and 1.0% (0.09 m^3/s) increase in Schoolhouse Creek.

Table 15 – Control Points Peak Discharge Results

Tributary	Pre-Development Peak Discharge (m^3/s)	Post-Development Peak Discharge (m^3/s)	Difference
1	2.39	2.07	-13.4%
2	4.80	5.16	+7.5%
3	2.59	2.12	-18.1%
4	2.03	2.23	+9.9%
Total	**11.81**	**11.58**	**-1.9%**
Total to Doctor's Creek	2.39	2.07	-13.4%
Total to Schoolhouse Creek	9.42	9.51	+1.0%

10-Year and 100-Year Modelling Results

10-year and 100-year events were used to size conveyance infrastructure. The infrastructure sizing determined from modelling were provided in the drainage servicing plan presented in **Section 2.3.4**.

3.0 Class C Capital Cost Estimate

Capital costs have been estimated to Class C for all servicing infrastructure required within the Plan Area. The estimated total capital cost to service the Plan is $29.64 million, consisting of $14.10 million for waterworks, $5.49 million for sanitary, and $10.04 million for storm, summarized below in **Table 16.** Please note the estimated capital costs are based on the 2025 market values and include 25% contingency and 15% engineering.

Table 16 – Infrastructure Servicing Capital Costs

Item	Cost	Contingency (25%)	Engineering (15%)	Total
1. Water				
Waterworks	$ 5,073,000	$ 1,268,000	$ 761,000	**$ 7,102,000**
PRV Station (4×$375,000/ea.)	$ 1,500,000	$ 375,000	$ 225,000	**$ 2,100,000**
Booster Pump (2×$500,000/ea.)	$ 1,000,000	$ 250,000	$ 150,000	**$ 1,400,000**
Reservoir (1×$2,500,000/ea.)	$ 2,500,000	$ 625,000	$ 375,000	**$ 3,500,000**
Subtotal	*$ 10,073,000*	*$ 2,518,000*	*$ 1,511,000*	***$ 14,102,000***
2. Sanitary				
Gravity Main	$ 3,582,000	$ 896,000	$ 537,000	**$ 5,015,000**
Low Pressure Main	$ 42,000	$ 11,000	$ 6,000	**$ 59,000**
Pump Station (Low Pressure Main)	$ 300,000	$ 75,000	$ 45,000	**$ 420,000**
Subtotal	*$ 3,924,000*	*$ 982,000*	*$ 588,000*	***$ 5,494,000***
3. Storm				
Gravity Mains & Culverts	$ 7,171,000	$ 1,793,000	$ 1,076,000	**$ 10,040,000**
Subtotal	*$ 7,171,000*	*$ 1,793,000*	*$ 1,076,000*	***$ 10,040,000***
TOTAL	***$ 21,168,000***	***$ 5,293,000***	***$ 3,175,000***	***$ 29,636,000***